Researchers look to improve use of phosphorus

Are you building up or running down soil phosphorus levels? Whatever the current P status, how can you optimise its use for maximum crop yield and quality? *Sarah Henly* asks researcher Roger Sylvester-Bradley of Adas

TIM SCRIVENER

Research is being carried out to compare organic sources of phosphorus with bagged fertiliser, as a way for farmers to maintain soil levels of the nutrient.

To maximise the cost-effectiveness of phosphorus management, you need to know what happens to the nutrient in the system.

And then how this relates to changes in soil P status over time, with and without fertilisers.

Previous AHDB-funded work has given soil scientists many leads on the required P levels for crops in soils of various types. But this five-year project will consolidate and extend the research on the nutrient.

Adas' Prof Sylvester-Bradley wants evidence to provide growers with robust advice to improve P management of modern combinable crops. That will involve studying how best to interpret soil P analyses, and checking critical P levels and the value of fresh fertiliser applications for yield and quality.

The *Survey of Fertiliser Practice* suggests that since 1990, when P in soils supporting winter wheat crops was largely abundant – equivalent to index 2 – phosphate inputs have fallen significantly. By 2000, growers were using 20kg/ha less phosphate and by 2010, 40kg/ha less than the average recommendations of the time.

FUTURE DEFICIENCY

Surprisingly, some wheat yields haven't reacted to falling phosphorus levels, even where P holidays (omitting applications altogether) have been taken. But there is concern that, on some farms, deficiencies will soon arise, he says.

"The rate at which soil P levels decline may be different on different soils. At present, Defra's *Fertiliser Manual RB209* doesn't differentiate between soil types. We need to understand what is controlling P run-down as regards soil texture, pH and organic matter."

"The rate at which soil P levels decline may be different on different soils"

Roger Sylvester-Bradley

Prof Sylvester-Bradley and co-researchers are exploiting established trial sites with known P levels to learn more about the balance between what a crop takes off and what a grower needs to put on. Basing current P fertiliser policy on a P-balance approach may not be right for all situations, he warns.

Research is comparing P additions from both fertiliser and organic P sources as ways of maintaining soil phosphorus. The value of fresh fertiliser applications is also being assessed in terms of crop yield and quality.

It may be that targeting the crop rather than the soil is the way forward, to optimise cost-effectiveness, he says. Placement of fertiliser next to the seed is a practical solution to better uptake.

YIELD INCREASE

In winter and spring barley trials, a yield benefit of 0.2-0.4t/ha resulted from placing fertiliser P rather than broadcasting it. Further large-scale trials will ascertain the cost-effectiveness of such a practice.

Meanwhile, his advice is to have soils analysed for P every four years, and to keep the approach to sampling and testing consistent with what you have done before.

"Sample the same area to the same soil depth as last time – usually the top 6in and send the soil to the same laboratory for testing. Check the level against what you have previously recorded to see whether P is doing what you expect it to, given the balance between additions and removals since last time."

Where levels have dipped to index 1 or below, consider placing P fertiliser near to seed when drilling, and for maintenance at higher indices, apply whenever it is convenient, concludes Prof Sylvester-Bradley.

Research reasons

AHDB CEREALS & OILSEEDS

This project aims to define critical soil phosphorus (P) needs for modern arable crops, understand how phosphorus levels in different soils are changing, and relate soil P status to the need for fertiliser applications.

Project: Cost-effective phosphorus management on UK arable farms (Sustainable-P)
Timescale: August 2013-December 2018
Researchers involved: Adas, Bangor University, Niab Tag and Rothamsted Research
Funders: AHDB, Frontier and SOYL
Cost: £249,600 from AHDB (total £283,600)

Key points

- Concern that P levels in UK soils falling
- Investigating whether that matters
- Comparing sources of P and how best to apply it

AHDB Cereals and Oilseeds perspective by *Sajjad Awan*

Research and knowledge transfer manager, AHDB

"During the past 30 years, fertiliser phosphorus inputs to arable land have been halved while average arable crop yields have been maintained or increased. But some growers are concerned they could be approaching a 'cliff edge' of P deficiency, especially where they take substantial 'P holidays'. Researching appropriate P levels for a range of soils and crops and seeing how they are best maintained will provide the information necessary to allow growers to optimise P applications."